

REMARKS

The Office Action dated 01/17/2003, together with the references included therein, has been carefully reviewed.

The disclosure is objected to for the reasons stated in the Office Action. Claims 1-66 stand rejected as being unpatentable, with patents to Lewis and Dangelmayer, et al being cited as evidence in support of the conclusion that the invention defined in Claims 1-66 is not patentable under the requirements of 35 U.S.C. §102.

It is noted that the drawings need not be amended as the error was in the specification which referred to element 37c twice. This error has been corrected and thus the drawings are consistent with the specification and need not be corrected. No further comments will be directed to this portions of the Office Action, and the remainder of this response will be directed to the rejections based on 35 U.S.C. §102.

It is noted that claims such as Claims 1, 17, 10, 19, 34, 42, 47, 48, 54 and 70 specifically define an inductor element. Furthermore, Claims 59, 64, 67-69 define steps that handle current in the manner of an inductor.

As discussed in the application, this limitation provides important advantages to the invention. An inductor is an element that stores energy in association with a flow of current and voltage across an inductor is proportional to the rate of change of the current rather than, as in a resistance, to the current itself. Instantaneous change in current through an inductor is not possible while such instantaneous change of current through a resistor is possible. A resistor is never considered as being an inductor, or as even having inductor-like properties (otherwise Ohm's Law would not be $E=IR$, but some time-dependent relationship). It is also noted that many manufacturers specifically advertise their resistors as being non-inductive. Thus, those skilled in the art never consider a resistor as having inductance.

Therefore, by specifically stating that there is an inductor element in the system, or that the system controls rise or build-up of current or is otherwise time dependent, the system and method thus defined will be different in function, operation and result from a system

that only has a resistor or that has no limitation as to time dependence or build up or rise time.

To emphasize the advantage associated with having an inductor in series with a contact element, one needs to only consider the voltage/inductance relationship of a circuit having an inductor: $Z=2\pi LF$, where L =inductance and F =frequency.

Yet another way of considering this situation is as follows. Today's electronic systems operate at clock, data, and pulses in the nanosecond and sub-nanosecond ranges-relating to frequency components in the gigahertz (10 to the 9th) to multigigahertz range. Tomorrow's systems will be even faster. In addition, signals are very minute, and a small amount of energy can disturb them, causing errors or failures. Also, capacitive coupling between circuits can conduct a disturbance from one circuit to another. Since capacitive coupling admittance increases with frequency, higher frequencies couple easier between circuits. For example, if a ground circuit for ESD discharge and a data cable lie near each other for a distance-such as in a modular furniture wiring channel-disturbance coupling may take place from the ESD grounding path into the data cable. As is well known, it is desirable to remove disturbance energy in the same frequency range as the electronic system of interest is operating in.

For example, consider a frequency of 10 gigahertz. During an electrostatic discharge, there are two sources of energy in this spectrum; (1) the discharge arc itself, since it is well known that spark gaps generate a wide range of RF energy, (2) the sharp rise time of the discharge current and peak waveshape where rise turns to fall of current.

The beneficial effect of adding a discrete inductor element, such as 10 millihenries, of significant value can be analyzed by a variety of methods.

First, consider an impedance analysis. At 10 gigahertz the impedance of the inductor element is 628 megohms, becoming the most major contributor of impedance and hence reduced current to the discharge path. On the other hand, consider a discharge path without a discrete inductor element (such as the Lewis patent). Assume an inductance of .02 microhenries which would be typical for the discharge gap and stray inductance of a carbon film resistor, At 10 gigahertz, this yields an impedance of only .00125 megohms. This small value is absolutely insignificant as a contributor of impedance to the discharge path.

Another method of analysis is to consider the formula for current rise in a circuit containing both a resistor and inductor element. Excerpts (Figure A) from Hunter College ~~Inductor-Resistor Circuits~~ Course notes clearly indicate the value of the inductor element. With no inductor, current instantly rises to V/R . With an inductor element

added, current rises smoothly and slowly as shown on the top of page two of the notes. Note that the time for the voltage to rise to half final value is $.69L/R$, directly linear to the value of L . Using typical values as above of .02 microhenries (spark gap and resistor inductance) as compared to adding an inductor element of 10 millihenries clearly shows the inductor element benefit via a slowing in rise time by a factor of 500,000:1! This is accompanied by a related significant decrease in high frequencies potentially causing system interference.

Another confirming analysis can be done using well-known SPICE circuit simulation software. Figure B is a graph focusing on the rise time portion of a standard Human Body Model ESD discharge into a circuit consisting of the 10 millihenry inductor element and 10 Meg resistor. The benefit of the inductor can clearly be seen in the gradual rise and well as the gradual curve into the discharge portion of the event.

The high frequency energy contributed by the spark gap is also reduced dramatically in a similar manner by the added inductor element.

To compare two inductances, it is convenient to use a ratio $Z_1/Z_2 = (L_1/L_2)F$. Thus, if a circuit has an inductance of 0.01 microhenries is compared to a circuit having an inductance of 10 millihenries, the ratio becomes 10^6 . Thus, if a circuit having an inductance of 10 millihenries has an

effective reactive impedance of one million times that of the circuit with an inductance of 0.01 microhenries. Since impedance is a measure of how well the circuits will protect a user from ESD and attenuate radio frequency (RF) interference, the inclusion of an inductor element in the circuit produces an astounding difference in impedance. Of course, if the circuit has no inductor, the ratio of impedance is infinite. The Lewis patent does not even mention inductance *except as stray in the spark gap*, but only has resistance. Certainly, the Lewis patent does not disclose an inductor element. Even if, *arguendo*, it is assumed that some inductance is associated with a resistor, which it is not, there is no disclosure in the Lewis patent suggesting that any use should be made of such inductance, or where such inductance is located, or how it is connected to the remainder of the circuit. Thus, it is hindsight to view the Lewis patent as disclosing some form of inductance in the circuit.

[The Lewis patent discloses a purely resistive circuit. There is no disclosure teaching or even suggesting that some form of inductance could or should be used in the Lewis circuit.

The only mention of inductance in the Lewis patent is in column 4, lines 2+ in which it is stated that the time constant for an arc does not depend on inductance in the circuit. Such a disclosure in no way suggests that an

inductor element should be included in the circuit or that a method should control current in a time-dependent manner. This means that the Lewis disclosure actually teaches away from the invention defined in applicant's claims.

Neither Lewis, nor any of the other prior art, takes into account the time-dependent function of an ESD discharge operation. The prior art simply does not appreciate that the discharge is time dependent. Thus, none of the prior art disclosures even consider using a time dependent circuit element. Thus, none of the prior art disclosures has any teaching or suggestion of an inductor, or a time-dependent element such as defined in applicant's claims.

For this reason the invention defined in applicant's claims is not suggested anywhere in the prior art, and certainly is not anticipated by the prior art, including the Lewis patent.

The Dangelmayer et al patent is cited as disclosing a headset. However, this patent specifically teaches the use of a grounding cable or another such element that is in constant contact with the user. The drawbacks of such systems were discussed in the application and attention is directed to pages 4 and 5 of the application. The Dangelmayer et al patent has no disclosure of an inductor element or a time-dependent control of the current in the circuit. Therefore, there is no disclosure in the

Dangelmayer et al patent suggesting applicant's claimed invention.

It is also noted that the Office Action rejected Claim 50 based on Lewis. However, there is no disclosure in the Lewis patent of a Litz wire. Therefore, the Lewis patent disclosure certainly does not anticipate the invention defined in Claim 50, and does not render such invention unpatentable under the requirements of 35 U.S.C. §103.

The Esper patent is cited as disclosing a transistor and is applied against Claim 9. Furthermore, the Esper application of a transistor is entirely different and not related to the function of the transistor in the instant application, Claim 9. Esper uses the transistor to turn on an LED light when high voltage is present on the human body. The present application Claim 9 uses the transistor as a variable transistor on the ESD discharge path. Since Claim 9 depends from Claim 1, the limitation regarding an inductor element is included in Claim 9. Since there is no disclosure in either the Esper patent or the Lewis patent suggesting the inductor element, adding the disclosure of the Esper patent to that of the Lewis patent does not render Claim 9 unpatentable. Accordingly, Claim 9 should be allowed.

The Johnson patent is cited as disclosing a three prong electrical plug and is combined with the disclosure of the Lewis patent to reject Claims 20, 21, 27-33 and 55. However, these claims depend on Claim 1 and hence have a system with

an inductor element and since the Johnson patent does not have any disclosure suggesting an inductor element or a time dependent control, adding the disclosure of the Johnson patent to that of the Lewis patent does not render Claims 20, 21, 27-33 and 55 unpatentable. Furthermore, Johnson does not contain or refer to a series resistor element.

It is also noted that Claim 17 defines a one foot separation between elements. This is another feature overlooked in the prior art, including the Lewis patent. That is, the resistor is placed at a strategic location in the series circuit closest to the contact element to reduce the availability of electrons from earth, the length of the metal discharge wire and the inductor. This reduces the shock a user might feel upon initial contact with the contact element by limiting the flow of electrons and therefore the severity of the arc) zapping the user. Since the resistors are in series, it would be typical and cheaper just to use one resistor with a value of R_1 plus R_2 . However, physical position of the first resistor element is important. The first resistor is positioned in the circuit adjacent to the contact means so as to limit the electrical current flow rate to the contact means from the grounding means as well as the other components of the discharge circuit.

The remaining claims depend from the above-discussed independent claims and add further limitations thereto. As such, these dependent claims, also, should be allowed.

Therefore, the claims as now submitted should be allowed.

The remaining references included with the Office Action have been reviewed. Applicant observes that none of these references has disclosure rendering the claimed invention unpatentable.

In view of the foregoing amendments and remarks, it is believed that this application is now in condition for allowance. Accordingly, review and allowance are requested.

Respectfully submitted,



Terry M. Gernstein

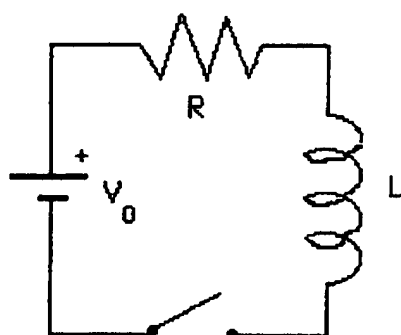
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HUNTER COLLEGE OF CUNY

Electromagnetic Induction: LR Circuits

Inductor-Resistor Circuits: Consider what happens if we have a resistor in series with an inductor:



After the switch is closed, the current supplied by the battery is given by

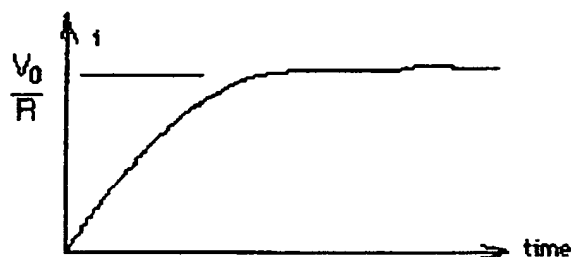
$$i(t) = \frac{V_0}{R} \left(1 - e^{-\frac{t}{\tau}} \right)$$

where the time constant is given by

$$\tau = \frac{L}{R}$$

Note the units of inductance, L are volt-sec/amp while the units of resistance, R are volt/amp. Thus the units of τ are seconds as expected.

A sketch of the current as a function of time appears



EXAMPLE: A $200\ \Omega$ resistor and a 150 mH inductor are connect to a 12 volt battery. What is the final voltage across the resistor? When does the voltage across the resistor reach half this value?

The final current is just $i(t \rightarrow \infty) = \frac{V_0}{R}$ since ultimately the inductor has no effect. The final voltage across is the resistor is just $V(t \rightarrow \infty) = i(t \rightarrow \infty) R = \frac{V_0}{R} R = V_0 = 12\text{ V}$

which is the battery voltage. The equation for the time dependence of the current yields

$$6 = 12 \left(1 - e^{-\frac{t}{\tau}} \right)$$

or

$$e^{-\frac{t}{\tau}} = \left(1 - \frac{1}{2} \right) = \frac{1}{2}$$

Taking logarithms yields $-\frac{t}{\tau} = -0.69$ since $\ln 0.5 = -0.69$ So $t = 0.69 \tau$ The time constant is

$$\tau = \frac{0.15\text{ H}}{200\ \Omega} = 7.5 \times 10^{-4}\text{ Sec}$$

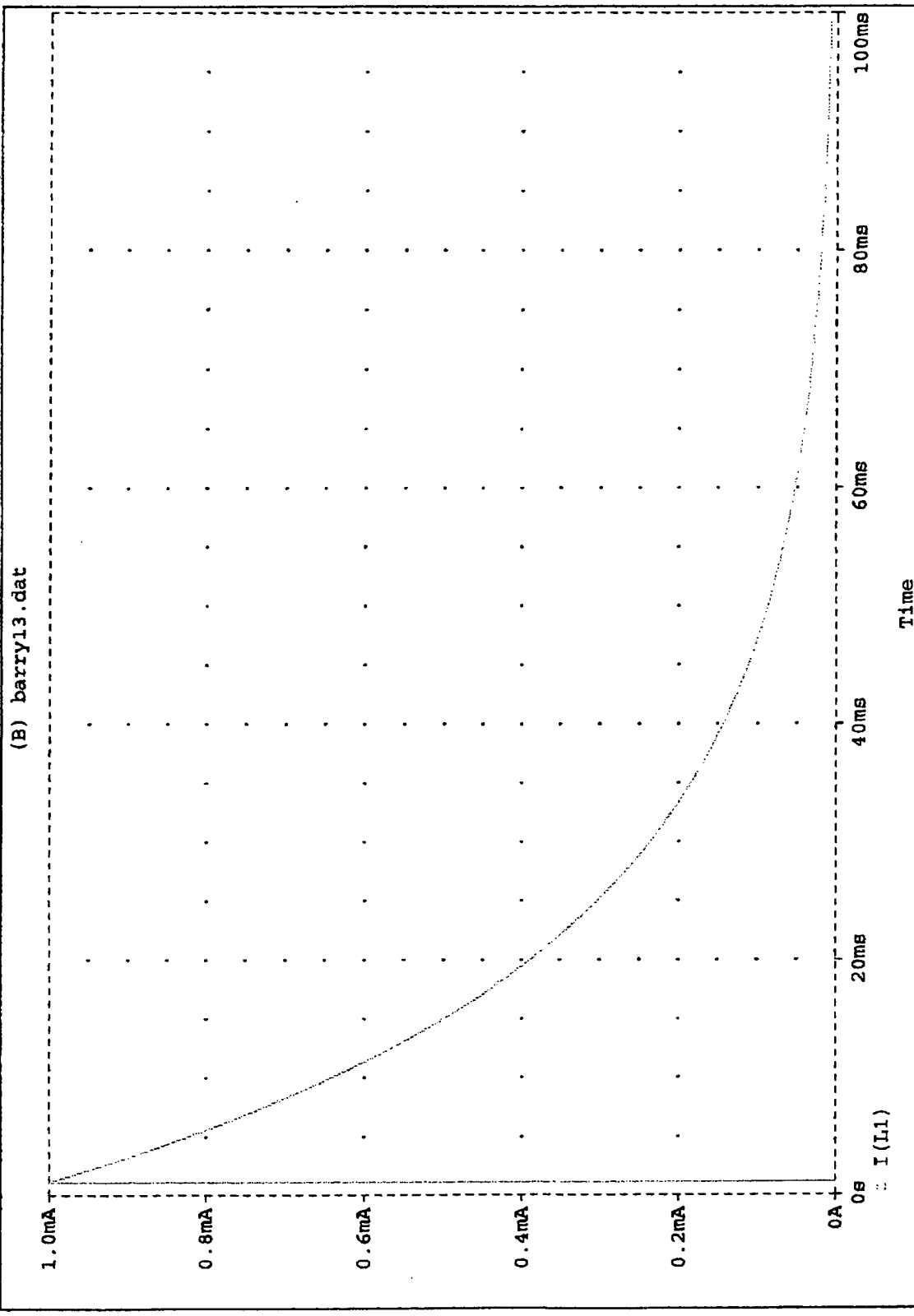
Thus the time where the voltage across the resistor is half its final value is $t = 5.2 \times 10^{-4}\text{ Sec}$

BACK

BARRY12 * RLC CIRCUIT HUMAN BODY MODEL * J R LEMBURG / B EPSTEIN

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Temperature: 27.0



Time: 14:23:53

Page 1

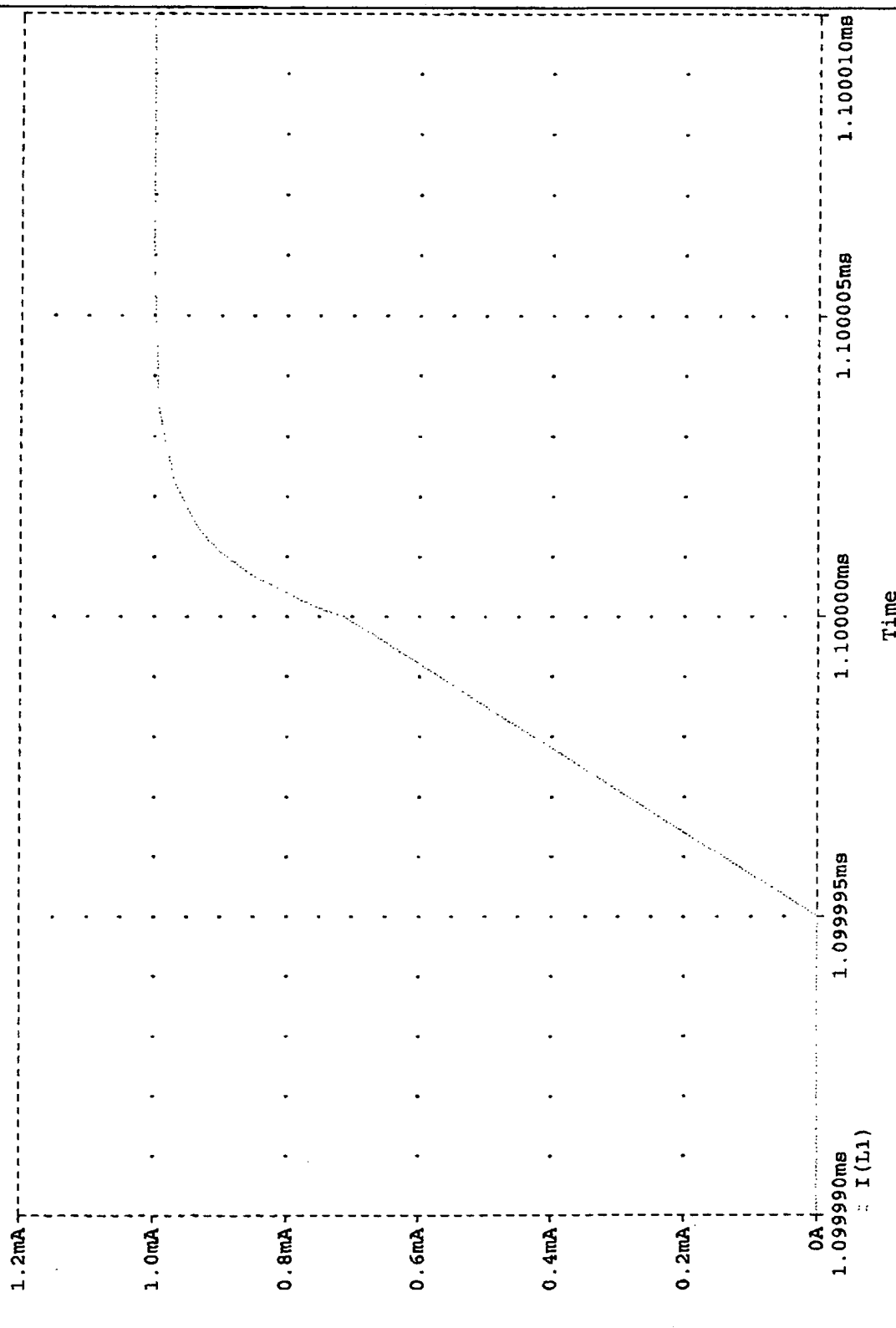
Date: March 12, 2003

BARRY10 * RLC CIRCUIT HUMAN BODY MODEL * J R LEMBURG / B EPSTEIN

Date/Time run: 03/12/103 13:44:56

Temperature: 27.0

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Date: March 12, 2003

Page 1

Time: 13:51:18

AMENDED PAGES OF SPECIFICATION

eliminates or reduces the wire itself and the eventual earthing from contributing to the initial walk-up shock or subsequent shock by a static-charged user upon making contact with the contact element.

5 Circuit 26 shown in Figure 2d is used in connection with multiple contact elements or surfaces $26s^1 \dots 26s^n$ and all such elements include a resistor, such as resistor $26R^1 \dots 26R^n$, each of which is connected to conductor 26c which has a resistor 26R and can include an inductor 26L as well connected to ground element 26E. Resistors 26s reduce the number of electrons
10 immediately available at each individual contact element or contact surface to neutralize a user charge.

Circuit 28 is shown in Figure 2e and includes a resistor 28R located in conductor 28c adjacent to contact element 28S.

It is also noted that additional circuit elements can be
15 included in conductor c as performance demands. Thus, as shown in Figure 2f, circuit 30 includes a capacitor 32 while circuit 34 in Figure 2g includes a transistor 36. Both of these circuit elements are in addition to the above-discussed resistors and inductors.

20 Figure 2h shows a system 37 for protecting a person from surprise or uncomfortable electrostatic discharge (ESD) and which comprises: an electrostatic discharge conducting contact element 37S which is in time-extended contact with a person who is to be protected from electrostatic discharge when in use; a

control circuit 37C electrically connected to contact element 37S by a conductor 37[C]e. The control circuit includes a first resistor element 37R which is in series with the contact element and which has a resistance which will drain some, but not all, ESD from contact element 37S. The system further includes a ground circuit 37G which is electrically associated with control circuit 37C either by electrical conductors or by over-the-air signals such as radio signals. Resistor 37R is physically located near contact element 37S, such as within one foot thereof. Resistor 37R can have a value that ranges from as low as one megohm to as high as more than one hundred megohms. As shown in Figure 2h, circuit 37C further includes a second resistor 37R' that is located physically close to ground circuit 37G to prevent shock associated with an improperly grounded circuit, and can have a value in the range of one megohm.

As shown in Figure 2h, a jack connector 37j can be used to electrically connect circuit 37C to contact element 37S. Thus, if contact element 37S is a computer element, such as a keyboard, logic circuit, mouse, mouse pad or the like, circuit 37C can be releasably connected thereto using jack 37j. As will be understood from this disclosure, any of the circuits shown herein can be releasably connected to a contact element using a jack. Thus, while a jack may not be specifically shown in each figure, it is to be understood that such a releasable connection can be used between the circuit and the contact element. The specific

AMENDED CLAIMS

AMENDED CLAIMS

1 (Amended). A system for protecting a person from surprise or uncomfortable electrostatic discharge (ESD) comprising:
an electrostatic discharge conducting contact element which is in time-extended contact with a person who is to be protected from electrostatic discharge when in use;
a control circuit electrically connected to said contact element, said control circuit including a first resistor element having a resistance which upon initial contact between the person and said contact element will drain some, but not all, electrostatic discharge from said contact element;
an inductor element in series with said contact element; and
a ground circuit electrically associated with said control circuit.

2 (Amended). The system defined in Claim 1 wherein the first resistor element is physically located closely adjacent to said contact element and is in series with said inductor element.

3 (Amended). The system defined in Claim 1 wherein said first resistor element is in series with said time-extended contact element and is in series with said inductor element.

7 (Amended). The system defined in Claim 1 wherein said control circuit further includes a second resistor, and said second

resistor has a value of at least one megohm and is in series with said inductor element.

17 (Amended). A system for protecting a person from surprise or uncomfortable electrostatic discharge (ESD) comprising:
an electrostatic discharge conducting contact element which is in
time-extended contact with a person who is to be protected
from electrostatic discharge when in use;
a control circuit electrically connected to said contact element,
said control circuit including a first resistor element in
series with said contact element and being located within
one foot of said contact element; an inductor element
separate from the first resistor element; and
a ground circuit electrically associated with said control
circuit.

19 (Amended). A system for protecting a person from surprise or uncomfortable electrostatic discharge (ESD) comprising:
an electrostatic discharge conducting contact element which is in
time-extended contact with a person who is to be protected
from electrostatic discharge when in use;
a control circuit electrically connected to said contact element,
said control circuit including a first resistor element in

series with said contact element and having a resistance in excess of five megohms; [and]
an inductor element; and
a ground element electrically connected to said control circuit.

34 (Amended). A system for protecting a person from surprise or uncomfortable electrostatic discharge (ESD) comprising:

a headphone device;

an electrostatic discharge conducting contact element which is located in said headphone device to be in time-extended contact with a person who is using said headphone device and who is to be protected from electrostatic discharge when using said headphone device;

a control circuit electrically connected to said contact element, said control circuit including a first resistor element in series with said contact element and having a resistance which will upon initial contact between the user and said contact element drain some, but not all, ESD from said contact element and an inductor element; and

a ground circuit electrically associated with said control circuit.

42 (Amended). A system for protecting a person from surprise or painful electrostatic discharge (ESD) comprising:

a user contacting device having a plurality of user contacting locations thereon;

an electrostatic discharge conducting contact element at each user contacting location of the plurality of user contacting locations and which contact a user in a time-extended manner when in use;

a control circuit electrically connected to each of said contact elements and including a first resistor having a resistance that is sized to upon initial contact between the user and said contact element drain some, but not all, electrostatic charge from said contact element and an inductor element;

and

a ground circuit electrically associated with said control circuit.

47 (Amended). A system for protecting a person from surprise or uncomfortable electrostatic discharge (ESD) comprising:

a computer mouse;

an electrostatic discharge conducting contact element which is located in said computer mouse to be in time-extended contact with a person who is using said computer mouse and who is to be protected from electrostatic discharge when using said computer mouse;

a control circuit electrically connected to said contact element,
said control circuit including a first resistor element
having a resistance which will upon initial contact between
the user and said contact element drain some, but not all,
electrostatic charge from said contact element and an
inductor element; and
a ground circuit electrically associated with said control
circuit.

48 (Amended). A system for protecting a person from surprise or
uncomfortable electrostatic discharge (ESD) comprising:

a computer keyboard;

an electrostatic discharge conducting contact element which is
located in said computer keyboard to be in time-extended
contact with a person who is using said computer keyboard
and who is to be protected from electrostatic discharge when
using said computer keyboard;

a control circuit electrically connected to said contact element,
said control circuit including a first resistor element
having a resistance which will upon initial contact between
the user and said contact element drain some, but not all,
electrostatic charge from said contact element, and an
inductor element; and

a ground circuit electrically associated with said control circuit.

54 (Amended). A system for protecting a person from surprise or uncomfortable electrostatic discharge (ESD) comprising:

an electrostatic discharge conducting contact element which is in time-extended contact with a person who is to be protected from electrostatic discharge when in use;

a ground circuit;

a conductor connecting said contact element to said ground circuit;

a first resistor element in said conductor near said ground circuit, said first resistor element being sized to prevent AC shock from moving from said ground circuit past said first resistor and through said conductor toward said contact element; [and]

a second resistor element in said conductor nearer to said contact element than said first resistor to reduce initial contact shock, said first and having a resistance which upon initial contact between the person and said contact element will drain some, but not all, electrostatic charge from said contact element by limiting the available current flow to the contact means; and

an inductor element electrically connected to said first resistor element.

56 (Amended). The system defined in Claim 48 further including an inductor element in series with said contact element.

57 (Amended). The system defined in Claim 47 further including an inductor element in series with said contact element.

58 (Amended). The system defined in Claim 42 further including an inductor element in series with each contact element.

59 (Amended). A method of protecting a person from surprise or uncomfortable electrostatic discharge (ESD) comprising:

 providing an electrostatic discharge (ESD) conducting contact element;

 initially contacting the ESD contact element for a time-extended period of longer than a touch;

 draining some, but not all, electrostatic charge during the initial contact; and
 reducing radio frequency interference associated with a build-up portion of said draining step.

64 (Amended). A system for protecting a person from surprise or uncomfortable electrostatic discharge (ESD) comprising:
an electrostatic discharge conducting contact element which is in

 means for contacting a person who is to be protected from

electrostatic discharge when in use in a time-extended manner;
means for draining some, but not all, electrostatic charge from
the person upon initial contact between that person and said
means for contacting a person;
means for reducing a build-up portion of radio frequency
interference associated with said means for draining; and
means for grounding said means for contacting a person.